

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

1807-0161P

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

10 / 003585

INTERNATIONAL APPLICATION NO.

PCT/SE00/01892

INTERNATIONAL FILING DATE

October 2, 2000

**PRIORITY DATE CLAIMED**

October 12, 1999

**TITLE OF INVENTION**

# ARRANGEMENT AND METHOD FOR HEIGHT ADJUSTMENT OF THE UPPER ATTACHMENT POINT OF A SAFETY BELT

**APPLICANT(S) FOR DO/EO/US**

TOLFSEN, Ulf; HORSRUD, Johan

**Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:**

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau). WO 01/26937
  - b. ☐ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☐ is transmitted herewith.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4)
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11. to 20. below concern document(s) or information included:**

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98, Form PTO-1449(s), and International Search Report (PCT/ISA/210) with 6 document(s).
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
  - 1.) Form PCT/IB/304
  - 2.) International Application
  - 3.) International Preliminary Examination Report (PCT/IPEA/409)

|  |  |   |  |  |  |
|--|--|---|--|--|--|
| U.S. APPLICATION NO. (if known, see 37 CFR 1.53)<br><b>10,088585</b> |  | INTERNATIONAL APPLICATION NO.<br>PCT/SE00/01892 |  | ATTORNEY'S DOCKET NUMBER<br>1807-0161P |  |
|--|--|---|--|--|--|

|   |              |              |            |                                       |          |
|---|--------------|--------------|------------|---------------------------------------|----------|
| 21. <input checked="" type="checkbox"/> The following fees are submitted:<br><b>BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):</b><br>Neither international preliminary examination fee (37 CFR 1.482)<br>nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO<br>and International Search Report not prepared by the EPO or JPO. .... <b>\$1,040.00</b><br><br>International preliminary examination fee (37 CFR 1.482) not paid to<br>USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$890.00</b><br><br>International preliminary examination fee (37 CFR 1.482) not paid to USPTO<br>but international search fee (37 CFR 1.445(a)(2)) paid to USPTO. .... <b>\$740.00</b><br><br>International preliminary examination fee (37 CFR 1.482) paid to USPTO<br>but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$710.00</b><br><br>International preliminary examination fee (37 CFR 1.482) paid to USPTO<br>and all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$100.00</b><br><b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b> |              |              |            | <b>CALCULATIONS      PTO USE ONLY</b> |          |
|   |              |              |            | \$                                    | 1,040.00 |
| Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30<br>months from the earliest claimed priority date (37 CFR 1.492(e)).  |              |              |            | \$                                    | 130.00   |
| CLAIMS  | NUMBER FILED | NUMBER EXTRA | RATE       |                                       |          |
| Total Claims  | 13 - 20 =    | 0            | X \$18.00  | \$                                    | 0.00     |
| Independent Claims  | 2 - 3 =      | 0            | X \$84.00  | \$                                    | 0.00     |
| MULTIPLE DEPENDENT CLAIM(S) (if applicable) Yes   |              |              | + \$280.00 | \$                                    | 280.00   |
| <b>TOTAL OF ABOVE CALCULATIONS =</b>  |              |              |            | \$                                    | 1,320.00 |
| <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are<br>reduced by 1/2.   |              |              |            | \$                                    | 0.00     |
| <b>SUBTOTAL =</b>   |              |              |            | \$                                    | 1,320.00 |
| Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30<br>months from the earliest claimed priority date (37 CFR 1.492(f)).  |              |              |            | \$                                    | 0.00     |
| <b>TOTAL NATIONAL FEE =</b>   |              |              |            | \$                                    | 1,320.00 |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be<br>accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property +  |              |              |            | \$                                    | 0.00     |
| <b>TOTAL FEES ENCLOSED =</b>  |              |              |            | \$                                    | 1,320.00 |
|   |              |              |            | Amount to be:<br>refunded             | \$       |
|   |              |              |            | charged                               | \$       |

a. ☒ A check in the amount of \$ **1,320.00** to cover the above fees is enclosed.

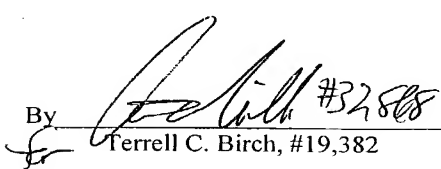
b. ☐ Please charge my Deposit Account. No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
 A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
 overpayment to Deposit Account No. 02-2448.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR  
 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:  
**Birch, Stewart, Kolasch & Birch, LLP** or Customer No. 2292  
**P.O. Box 747**  
**Falls Church, VA 22040-0747**  
**(703) 205-8000**

**Date:** March 21, 2002

By  #32808  
 Terrell C. Birch, #19,382

1004107088585102

JC10 Rec'd PCT/PTO 2 1 MAR 2002

PATENT  
1807-0161P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: TOLFSEN, Ulf et al.  
Int'l. Appl. No.: PCT/SE00/01892  
Appl. No.: New Group:  
Filed: March 21, 2002 Examiner:  
For: ARRANGEMENT AND METHOD FOR HEIGHT  
ADJUSTMENT OF THE UPPER ATTACHMENT  
POINT OF A SAFETY BELT

PRELIMINARY AMENDMENT

**BOX PATENT APPLICATION**

Assistant Commissioner for Patents  
Washington, DC 20231

March 21, 2002

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/SE00/01892 which has an International filing date of October 2, 2000, which designated the United States of America.--

Docket No. 1807-0161P

IN THE CLAIMS:

Please amend the claims as follows:

8. (Amended) Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that the upper attachment point (2) is arranged in a fixed manner on a slide (15) which is arranged displaceably on a guide rail (16).

9. (Amended) Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that a belt reel (10) is arranged at the upper attachment point (2).

10. (Amended) Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that the upper attachment point (2) comprises a deflection means (11) for the safety belt (1).



## 4

112111 P/MAH

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1 JC10 Rec'd PCT/PTO 2 1 MAR 2002

## TITLE

Arrangement and method for height adjustment of the upper attachment point of a safety belt.

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## TECHNICAL FIELD

The present invention relates to an arrangement and a method for height adjustment of the upper attachment point of a safety belt, arranged in a vehicle with a vehicle seat which is spring-mounted in the vertical direction.

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## BACKGROUND ART

Height-adjusting arrangements for the upper attachment point of safety belts in vehicles are previously known. From US 5,102,166, for example, a height-adjusting arrangement for the upper attachment point of a safety belt is previously known, where the movement of the attachment point is a function of the movement in the longitudinal direction of the vehicle of a seat arranged in the vehicle. The movement of the seat is transmitted via a wire to a slide which runs in a vertical guide groove which is arranged in the body of the vehicle and is positioned at shoulder height of a person sitting in said seat.

20 Said guide groove comprises an upper and a lower end-position stop, which stops prevent the upper attachment point of the safety belt ending up too high or, respectively, low when the seat is located in its rear or, respectively, front position. The arrangement described above therefore means that when, for example, a tall person moves the seat backwards so as to achieve a suitable driving position, the upper attachment point is displaced upwards and in this manner takes up a position in the vertical direction which is optimum for said person.

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However, this previously known height-adjusting arrangement has the disadvantage that the movement of the upper attachment point of the safety belt takes place only as a function of the movement of the seat in the longitudinal direction of the vehicle. As it is common, in particular in lorries,

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buses and various types of utility vehicle, to provide vehicle seats with spring-mounting in the vertical direction in order to improve the comfort of occupants of the vehicles, the height of the vehicle seat should also be taken into consideration for satisfactory adjustment of the upper attachment point of the  
5 safety belt.

From EP 447,364, it is previously known, in a vehicle with a vehicle seat which is spring-mounted in the vertical direction, to arrange the upper attachment point of the safety belt on the backrest of the vehicle seat, which  
10 results in the attachment point being correctly positioned irrespective of the springing movement of the vehicle seat.

Although the known arrangement provides good adaptation of the upper attachment point of the safety belt during the springing movement of said  
15 vehicle seat, it suffers from certain disadvantages. One disadvantage is that the construction of the vehicle seat is relatively complicated as it has to be provided with strong reinforcements. Another disadvantage is that the vehicle seat usually has to be provided with means, for example a wire extending between the vehicle seat and the floor of the vehicle, in order to limit the  
20 springing movement in the event of, for example, heavy braking of the vehicle. Furthermore, the abovementioned arrangement means that the floor of the vehicle has to be reinforced, which increases the weight of the vehicle.

#### DISCLOSURE OF INVENTION

25 The principal object of the present invention is therefore to provide an arrangement and a method for height adjustment of the upper attachment point of a safety belt, arranged in a vehicle with a vehicle seat which is spring-mounted in the vertical direction, where the upper attachment point is arranged so as to follow in the vertical direction the springing movement of  
30 said vehicle seat. This is achieved by means of an arrangement and a method of the type referred to in the introduction, the characteristic features of which emerge from independent claims 1 and 11.



Further advantages and objects of the invention can be understood with the aid of the claims below and the description below.

#### BRIEF DESCRIPTION OF DRAWINGS

5 The invention is described below in connection with preferred exemplary embodiments and the appended figures, in which

- Figure 1 shows a vehicle seat on which a first preferred embodiment according to the invention can be seen,
- 10 Figure 2 shows a height-adjustable deflection means of the present invention,
- Figure 3 shows, partly in cross section, an operating lever with an associated locking pin in the released position,
- Figure 4 shows, partly in cross section, said operating lever with the locking pin in the locked position,
- 15 Figure 5 shows a vehicle seat with an advantageous alternative embodiment of the present invention, and
- Figure 6 shows a vehicle seat on which a further advantageous alternative embodiment according to the invention can be seen.

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#### MODE FOR CARRYING OUT THE INVENTION

Figure 1 shows a height-adjusting arrangement for the upper attachment point 2 of a safety belt 1 on a vehicle seat 3 which is arranged in a vehicle and comprises a backrest 4 and a sitting surface 5 attached to a seat underframe 6. The vehicle seat 3 is spring-mounted by means of a mounting arrangement having two pairs of intersecting link arms 8a, 8b, 8c, 8d interconnected in an articulated manner at points of intersection 7a, 7b, the link arm pairs 8a, 8b and 8c, 8d being arranged on opposite sides of the sitting surface 5 of the vehicle seat and being at their ends connected in such a manner to the seat underframe 6 and the vehicle floor 9 that the vehicle seat 3 is movable in the vertical direction relative to the vehicle floor 9, in addition to which spring means (not shown) are arranged so as to counteract

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the movement of the vehicle seat 3 in the direction towards the vehicle floor 9. A description of a vehicle seat according to the above is given in Swedish patent specification SE 366 505 which is incorporated herewith.

5 Figure 1 also shows how the safety belt 1 runs out of a belt reel 10, and via an upper deflection means 11 arranged at said upper attachment point 2. From the deflection means 11, the belt extends, over the shoulder of an imaginary occupant, to a second, lower deflection means 12 with an associated belt lock 13, which is arranged in a fixed manner in relation to the  
10 sitting surface 5, and on, over the hip of an imaginary occupant, to a lower attachment point 14 arranged in a fixed manner in relation to the sitting surface.

According to a preferred embodiment, the upper deflection means 11 and the  
15 belt reel 10 are mounted in a fixed manner on a slide 15 which is arranged displaceably on a guide rail 16. The slide 15 surrounds the guide rail 16, which is of rectangular cross section, by means of sliding joints 15a, 15b which are shaped so as essentially to surround the guide rail 16 and are therefore designed with a corresponding rectangular cross section.

20 A first link arm 17 is attached rigidly to the seat underframe 6 and connected, via a link arm articulation 18, to a second link arm 19 which is in turn connected to the slide 15 by means of an articulated connection 20, springing movement of the vehicle seat 3 then bringing about displacement of the slide  
25 15 and thus of the deflection means 11 arranged at the upper attachment point 2.

Figures 2, 3 and 4 show an especially preferred embodiment where the upper deflection means 11 is arranged adjustably in the vertical direction  
30 relative to the slide 15. In the embodiment shown, the upper deflection means 11 is attached by a screw connection 21 to a second slide 22 arranged displaceably on the slide 15. Said second slide 22 is provided with

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The invention is not limited to the exemplary embodiments described above and shown in the figures, but can be varied within the scope of the claims  
15 below. For example, the springing movement of the vehicle seat can be detected by an electric sensor and then recreated, at the upper attachment point of the safety belt, by an electric motor. Furthermore, said guide rail and slide can be designed with a different, for example circular, cross section.

1. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1), arranged in a vehicle with a vehicle seat (3) which is spring-mounted in the vertical direction, characterized in that the upper attachment point (2) is arranged displaceably in the vertical direction on the body of the vehicle and is connected to said vehicle seat (3) via movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) which cause the springing movement of the vehicle seat (3) to bring about a corresponding displacement of said upper attachment point (2).
2. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that said movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) comprise a link arm arrangement (17, 18, 19, 20) arranged between the vehicle seat (3) and the upper attachment point (2).
3. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 2, characterized in that said movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) comprise a first link arm (17) attached to the vehicle seat (3) and connected, via a link arm articulation (18), to a second link arm (19) which is connected to said upper attachment point (2).
4. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that said movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) comprise a push-pull cable (27), the first end (30, 31) of which is connected to the vehicle seat (3) and the second end (32) of which is connected to the upper attachment point (2).

5. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that said movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) comprise a first hydraulic arrangement (33) arranged on the vehicle seat (3) and a second hydraulic arrangement (34) arranged at the upper attachment point (2) and a hydraulic circuit (35) which interconnects said first and second hydraulic arrangements (33, 34).
6. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 5, characterized in that said first hydraulic arrangement comprises a hydraulic piston/cylinder assembly (33) arranged on the vehicle seat (3).
7. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 5 or 6, characterized in that said second hydraulic arrangement comprises a hydraulic piston/cylinder assembly (34) arranged at the upper attachment point (2).
8. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to any one of the preceding claims, characterized in that the upper attachment point (2) is arranged in a fixed manner on a slide (15) which is arranged displaceably on a guide rail (16).
9. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to any one of the preceding claims, characterized in that a belt reel (10) is arranged at the upper attachment point (2).
10. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to any one of the preceding claims,

11. Method for height adjustment of the upper attachment point of a  
5 safety belt, arranged in a vehicle with a vehicle seat which is spring-mounted  
in the vertical direction, c h a r a c t e r i z e d i n that said height adjustment  
takes place as a function of the vertical springing movement of the vehicle  
seat.

10    12.            Method for height adjustment of the upper attachment point of a safety belt according to claim 11, characterized in that the height adjustment takes place as a linear function of the springing movement of the vehicle seat.

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## ABSTRACT

The invention relates to an arrangement and a method for height adjustment of the upper attachment point of a safety belt, arranged in a vehicle with a vehicle seat which is spring-mounted in the vertical direction, where the upper attachment point is arranged displaceably in the vertical direction on the body of the vehicle. Said height adjustment takes place as a function of the springing movement of the vehicle seat, which results in the upper attachment point always remaining correctly positioned in the vertical direction.



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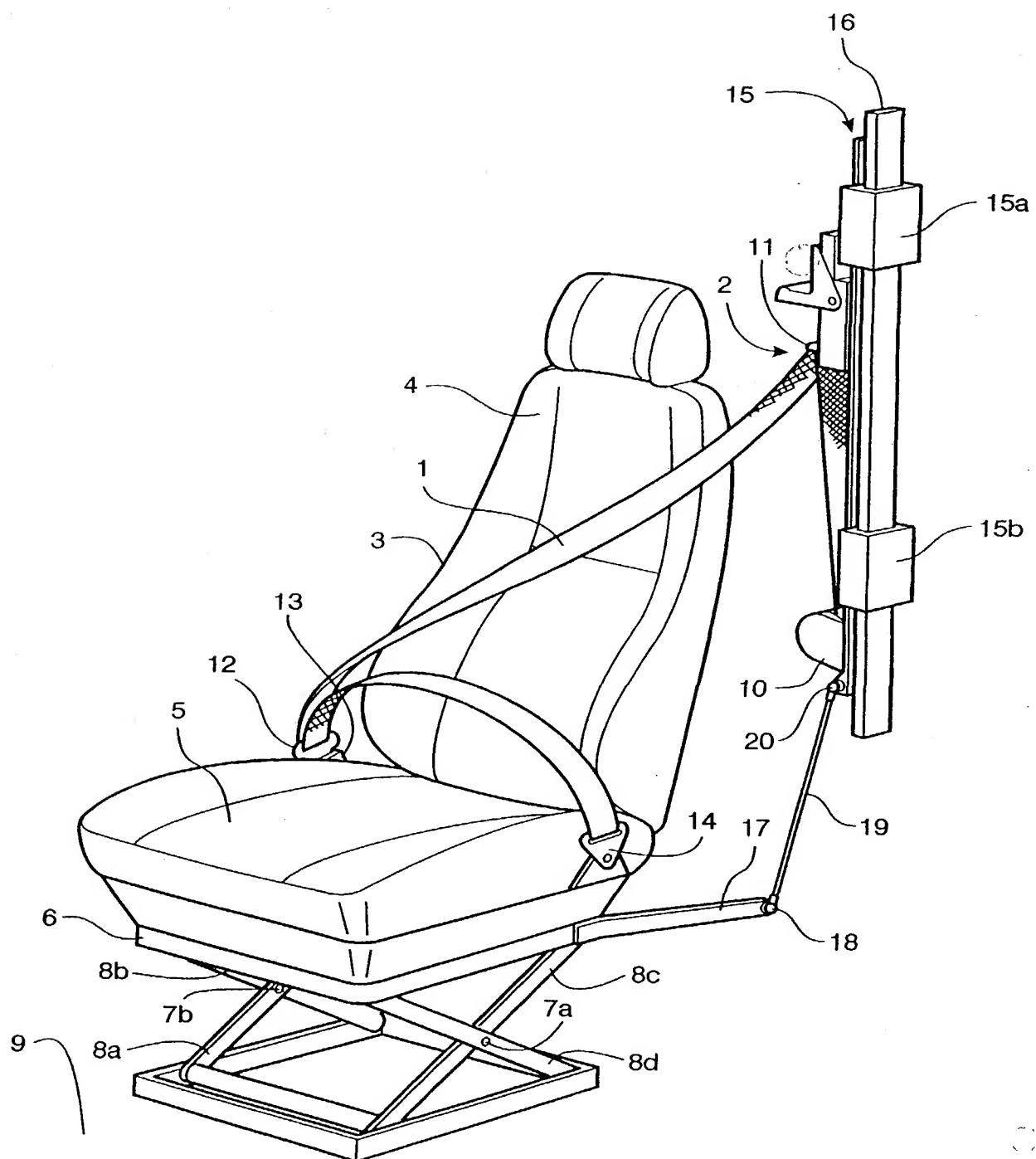


Fig.1

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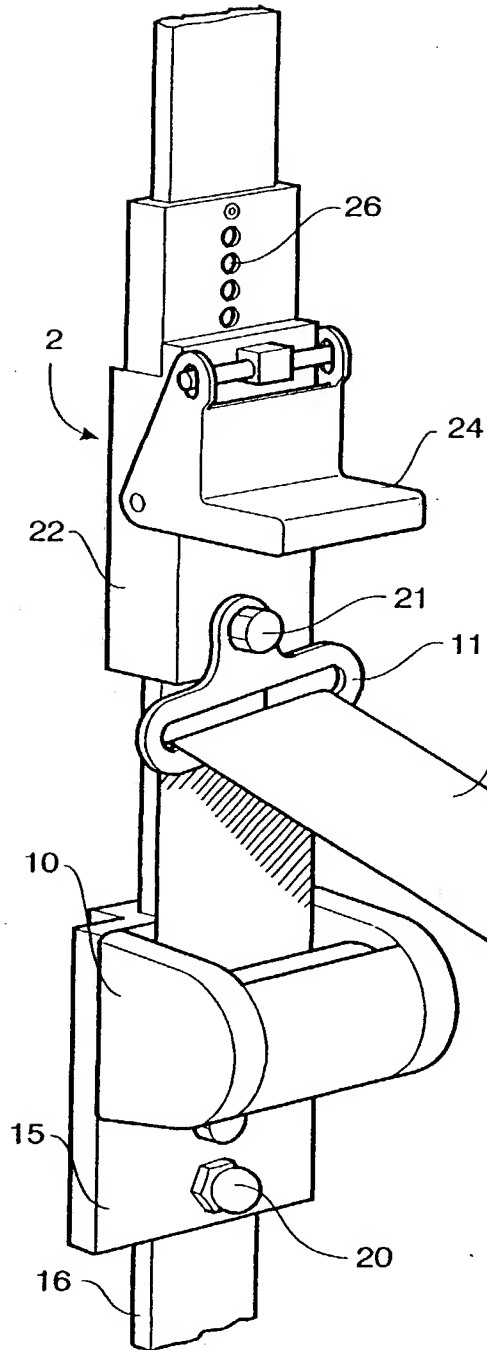


Fig.2

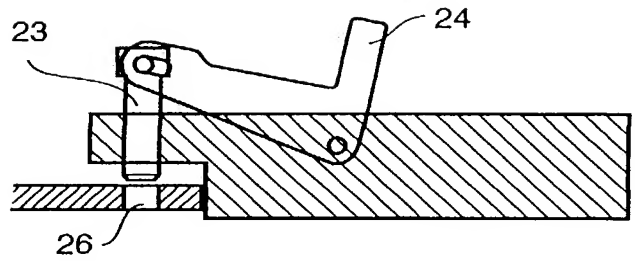


Fig.3

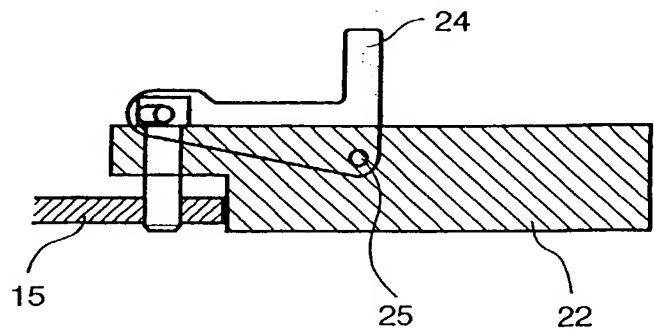


Fig.4

3/4

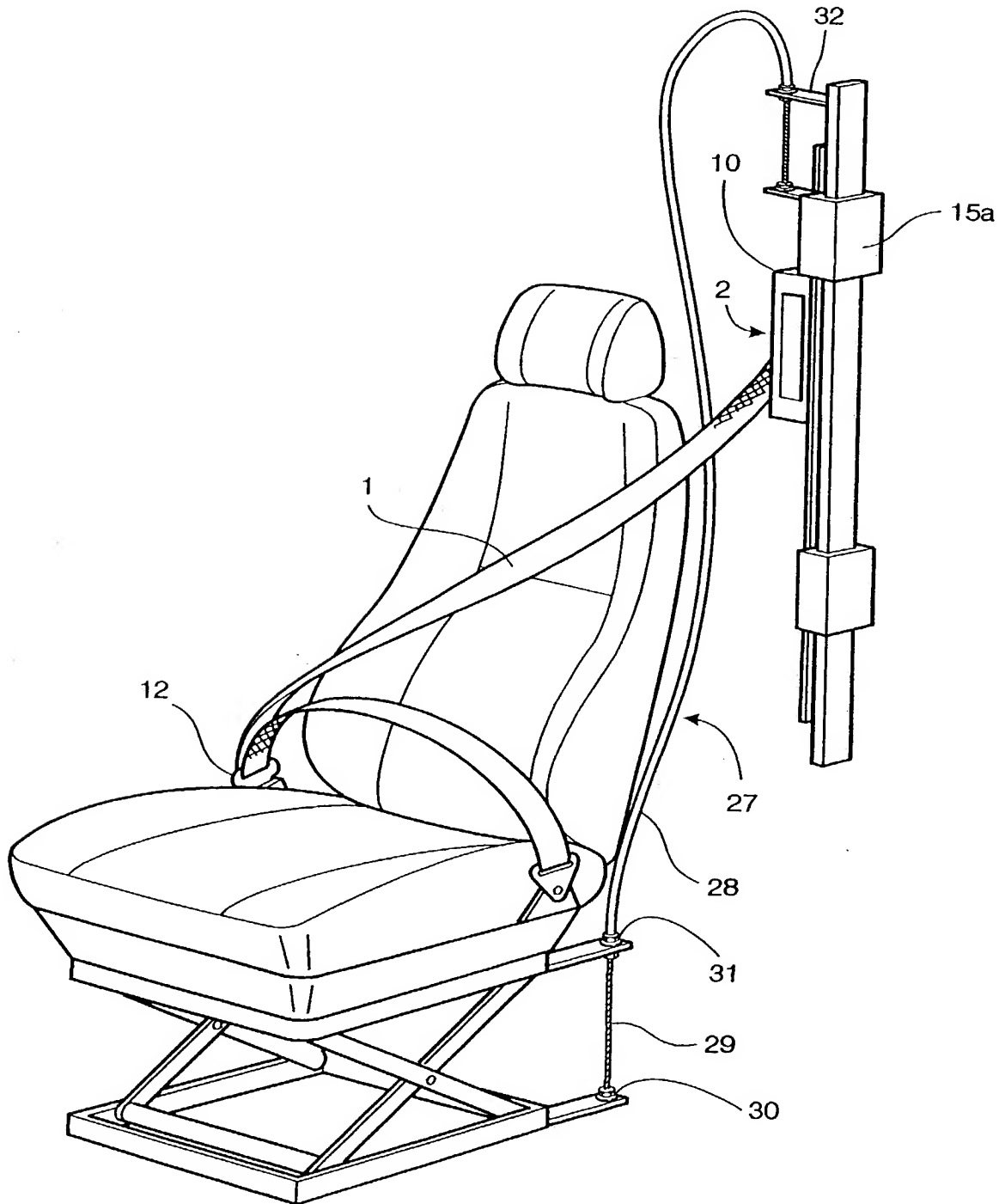


Fig.5

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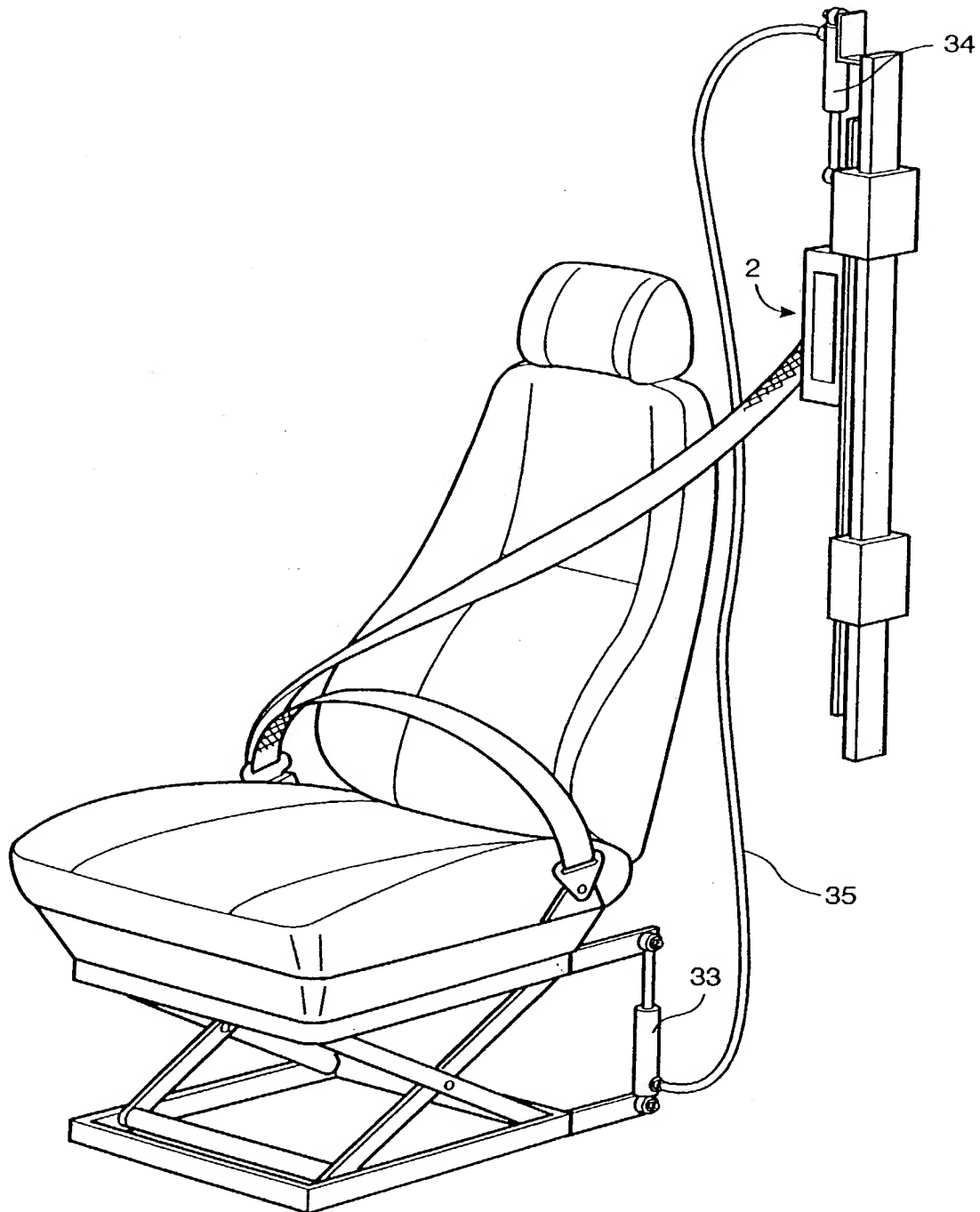


Fig.6

**TITLE**

### Arrangement and method for height adjustment of the upper attachment point of a safety belt.

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## TECHNICAL FIELD

The present invention relates to an arrangement and a method for height adjustment of the upper attachment point of a safety belt, arranged in a vehicle with a vehicle seat which is spring-mounted in the vertical direction.

-10

## BACKGROUND ART

Height-adjusting arrangements for the upper attachment point of safety belts in vehicles are previously known. From US 5,102,166, for example, a height adjusting arrangement for the upper attachment point of a safety belt is previously known, where the movement of the attachment point is a function of the movement in the longitudinal direction of the vehicle of a seat arranged in the vehicle. The movement of the seat is transmitted via a wire to a slide which runs in a vertical guide groove which is arranged in the body of the vehicle and is positioned at shoulder height of a person sitting in said seat.

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20 Said guide groove comprises an upper and a lower end-position stop, which stops prevent the upper attachment point of the safety belt ending up too high or, respectively, low when the seat is located in its rear or, respectively, front position. The arrangement described above therefore means that when, for example, a tall person moves the seat backwards so as to achieve a

25 suitable driving position, the upper attachment point is displaced upwards and in this manner takes up a position in the vertical direction which is optimum for said person.

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However, this previously known height-adjusting arrangement has the disadvantage that the movement of the upper attachment point of the safety belt takes place only as a function of the movement of the seat in the longitudinal direction of the vehicle. As it is common, in particular in lorries,

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buses and various types of utility vehicle, to provide vehicle seats with spring-mounting in the vertical direction in order to improve the comfort of occupants of the vehicles, the height of the vehicle seat should also be taken into consideration for satisfactory adjustment of the upper attachment point of the safety belt.

From EP 447,364, it is previously known, in a vehicle with a vehicle seat which is spring-mounted in the vertical direction, to arrange the upper attachment point of the safety belt on the backrest of the vehicle seat, which results in the attachment point being correctly positioned irrespective of the springing movement of the vehicle seat.

Although the known arrangement provides good adaptation of the upper attachment point of the safety belt during the springing movement of said vehicle seat, it suffers from certain disadvantages. One disadvantage is that the construction of the vehicle seat is relatively complicated as it has to be provided with strong reinforcements. Another disadvantage is that the vehicle seat usually has to be provided with means, for example a wire extending between the vehicle seat and the floor of the vehicle, in order to limit the springing movement in the event of, for example, heavy braking of the vehicle. Furthermore, the abovementioned arrangement means that the floor of the vehicle has to be reinforced, which increases the weight of the vehicle.

#### DISCLOSURE OF INVENTION

The principal object of the present invention is therefore to provide an arrangement and a method for height adjustment of the upper attachment point of a safety belt, arranged in a vehicle with a vehicle seat which is spring-mounted in the vertical direction, where the upper attachment point is arranged so as to follow in the vertical direction the springing movement of said vehicle seat. This is achieved by means of an arrangement and a method of the type referred to in the introduction, the characteristic features of which emerge from independent claims 1 and 11.

Further advantages and objects of the invention can be understood with the aid of the claims below and the description below.

#### BRIEF DESCRIPTION OF DRAWINGS

5 The invention is described below in connection with preferred exemplary embodiments and the appended figures, in which

Figure 1 shows a vehicle seat on which a first preferred embodiment according to the invention can be seen,

10 Figure 2 shows a height-adjustable deflection means of the present invention,

Figure 3 shows, partly in cross section, an operating lever with an associated locking pin in the released position,

15 Figure 4 shows, partly in cross section, said operating lever with the locking pin in the locked position,

Figure 5 shows a vehicle seat with an advantageous alternative embodiment of the present invention, and

Figure 6 shows a vehicle seat on which a further advantageous alternative embodiment according to the invention can be seen.

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#### MODE FOR CARRYING OUT THE INVENTION

Figure 1 shows a height-adjusting arrangement for the upper attachment point 2 of a safety belt 1 on a vehicle seat 3 which is arranged in a vehicle and comprises a backrest 4 and a sitting surface 5 attached to a seat underframe 6. The vehicle seat 3 is spring-mounted by means of a mounting arrangement having two pairs of intersecting link arms 8a, 8b, 8c, 8d interconnected in an articulated manner at points of intersection 7a, 7b, the link arm pairs 8a, 8b and 8c, 8d being arranged on opposite sides of the sitting surface 5 of the vehicle seat and being at their ends connected in such a manner to the seat underframe 6 and the vehicle floor 9 that the vehicle seat 3 is movable in the vertical direction relative to the vehicle floor 9, in addition to which spring means (not shown) are arranged so as to counteract

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the movement of the vehicle seat 3 in the direction towards the vehicle floor 9. A description of a vehicle seat according to the above is given in Swedish patent specification SE.366 505 which is incorporated herewith.

5 Figure 1 also shows how the safety belt 1 runs out of a belt reel 10, and via an upper deflection means 11 arranged at said upper attachment point 2. From the deflection means 11, the belt extends, over the shoulder of an imaginary occupant, to a second, lower deflection means 12 with an associated belt lock 13, which is arranged in a fixed manner in relation to the  
10 sitting surface 5, and on, over the hip of an imaginary occupant, to a lower attachment point 14 arranged in a fixed manner in relation to the sitting surface.

According to a preferred embodiment, the upper deflection means 11 and the  
15 belt reel 10 are mounted in a fixed manner on a slide 15 which is arranged displaceably on a guide rail 16. The slide 15 surrounds the guide rail 16, which is of rectangular cross section, by means of sliding joints 15a, 15b which are shaped so as essentially to surround the guide rail 16 and are therefore designed with a corresponding rectangular cross section.

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A first link arm 17 is attached rigidly to the seat underframe 6 and connected, via a link arm articulation 18, to a second link arm 19 which is in turn connected to the slide 15 by means of an articulated connection 20, springing  
25 movement of the vehicle seat 3 then bringing about displacement of the slide 15 and thus of the deflection means 11 arranged at the upper attachment point 2.

Figures 2, 3 and 4 show an especially preferred embodiment where the upper deflection means 11 is arranged adjustably in the vertical direction  
30 relative to the slide 15. In the embodiment shown, the upper deflection means 11 is attached by a screw connection 21 to a second slide 22 arranged displaceably on the slide 15. Said second slide 22 is provided with



a locking mechanism comprising a locking pin 23 which is operated by an operating lever 24 which is attached pivotably at an articulation 25. When the lever is operated counter to spring means (not shown), the locking pin 23 is brought out of engagement with locking holes 26 arranged in the slide 15, movement of the slide 22 relative to the slide 15 then being made possible. As a result, it is possible to adjust the upper attachment point 2 to the desired height depending on the load (the weight of the occupant) on the sitting surface 5 and the height of the occupant.

10 With reference to Figure 5, an advantageous alternative embodiment for transmitting the springing movement of the vehicle seat 3 to the upper attachment point 2 of the safety belt according to the invention is described. In this embodiment, what is known as a push-pull cable 27, that is to say a cable consisting of an outer covering 28 and a wire 29 which can transmit  
15 both tensile and compressive force, is arranged so as to transmit the springing movement of the vehicle seat to the upper attachment point 2. One end of the wire 29 is attached to a wire attachment 30 arranged in a fixed manner in relation to the vehicle floor 9, and its other end is attached to the slide 15, in addition to which one end of the outer covering 28 is attached  
20 firmly to an attachment 31 arranged in a fixed manner in relation to the seat underframe 6, and its other end is attached to an attachment 32 arranged in a fixed manner in relation to the guide rail 16.

Figure 5 also shows an advantageous alternative embodiment, according to  
25 the present invention, of the upper attachment point 2 of the safety belt, where the safety belt 1 runs out of a belt reel 10, over the shoulder of an imaginary occupant and, as already mentioned, on down to the second, lower deflection means 12. The result of this is that no upper deflection means is required and that the total length of the safety belt 1 can be made  
30 shorter.

Figure 6 shows a further advantageous alternative embodiment for transmitting the springing movement of the vehicle seat 3 to the upper attachment point 2 of the safety belt according to the invention. In this embodiment, a first hydraulic piston/cylinder assembly 33 is arranged  
5 between the seat underframe 6 and the vehicle floor 9, and a second hydraulic piston/cylinder assembly 34 is arranged between the slide 15 and the guide rail 16. Said first and second hydraulic piston/cylinder assemblies 33, 34 are coupled to one another, by a hydraulic pipe/tube, so that  
10 compression of the first hydraulic piston/cylinder assembly results in a corresponding linear expansion of the second hydraulic piston/cylinder assembly, and the slide 15 is thus displaced.

The invention is not limited to the exemplary embodiments described above and shown in the figures, but can be varied within the scope of the claims  
15 below. For example, the springing movement of the vehicle seat can be detected by an electric sensor and then recreated, at the upper attachment point of the safety belt, by an electric motor. Furthermore, said guide rail and slide can be designed with a different, for example circular, cross section.

## CLAIMS

1. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1), arranged in a vehicle with a vehicle seat (3) which is spring-mounted in the vertical direction, characterized in that the upper attachment point (2) is arranged displaceably in the vertical direction on the body of the vehicle and is connected to said vehicle seat (3) via movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) which cause the springing movement of the vehicle seat (3) to bring about a corresponding displacement of said upper attachment point (2).
2. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that said movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) comprise a link arm arrangement (17, 18, 19, 20) arranged between the vehicle seat (3) and the upper attachment point (2).
3. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 2, characterized in that said movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) comprise a first link arm (17) attached to the vehicle seat (3) and connected, via a link arm articulation (18), to a second link arm (19) which is connected to said upper attachment point (2).
4. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that said movement-transmitting means (17, 18, 19, 20; 27; 33, 34, 35) comprise a push-pull cable (27), the first end (30, 31) of which is connected to the vehicle seat (3) and the second end (32) of which is connected to the upper attachment point (2).

5. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 1, characterized in that said movement-transmitting means (17, 18, 19, 20, 27, 33, 34, 35) comprise a first hydraulic arrangement (33) arranged on the vehicle seat (3) and a second hydraulic arrangement (34) arranged at the upper attachment point (2) and a hydraulic circuit (35) which interconnects said first and second hydraulic arrangements (33, 34).

6. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 5, characterized in that said first hydraulic arrangement comprises a hydraulic piston/cylinder assembly (33) arranged on the vehicle seat (3).

7. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to claim 5 or 6, characterized in that said second hydraulic arrangement comprises a hydraulic piston/cylinder assembly (34) arranged at the upper attachment point (2).

8. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to any one of the preceding claims, characterized in that the upper attachment point (2) is arranged in a fixed manner on a slide (15) which is arranged displaceably on a guide rail (16).

9. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to any one of the preceding claims, characterized in that a belt reel (10) is arranged at the upper attachment point (2).

10. Height-adjusting arrangement for the upper attachment point (2) of a safety belt (1) according to any one of the preceding claims,

characterized in that the upper attachment point (2) comprises a deflection means (11) for the safety belt (1).

11. Method for height adjustment of the upper attachment point of a  
5 safety belt, arranged in a vehicle with a vehicle seat which is spring-mounted in the vertical direction, characterized in that said height adjustment takes place as a function of the vertical springing movement of the vehicle seat.

10 12. Method for height adjustment of the upper attachment point of a safety belt according to claim 11, characterized in that the height adjustment takes place as a linear function of the springing movement of the vehicle seat.

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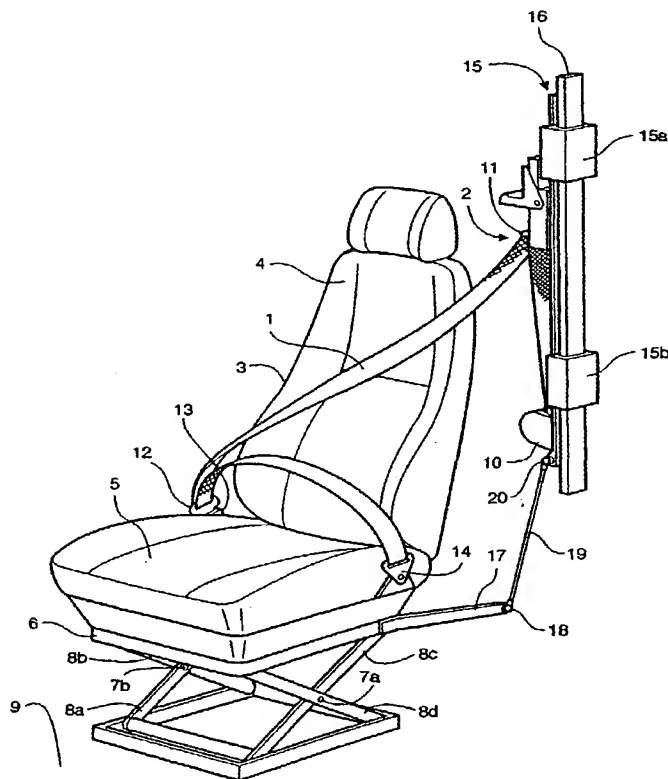
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[Continued on next page]

(54) Title: **ARRANGEMENT AND METHOD FOR HEIGHT ADJUSTMENT OF THE UPPER ATTACHMENT POINT OF A SAFETY BELT**

(57) Abstract: The invention relates to an arrangement and a method for height adjustment of the upper attachment point of a safety belt, arranged in a vehicle with a vehicle seat which is spring-mounted in the vertical direction, where the upper attachment point is arranged displaceably in the vertical direction on the body of the vehicle. Said height adjustment takes place as a function of the springing movement of the vehicle seat, which results in the upper attachment point always remaining correctly positioned in the vertical direction.

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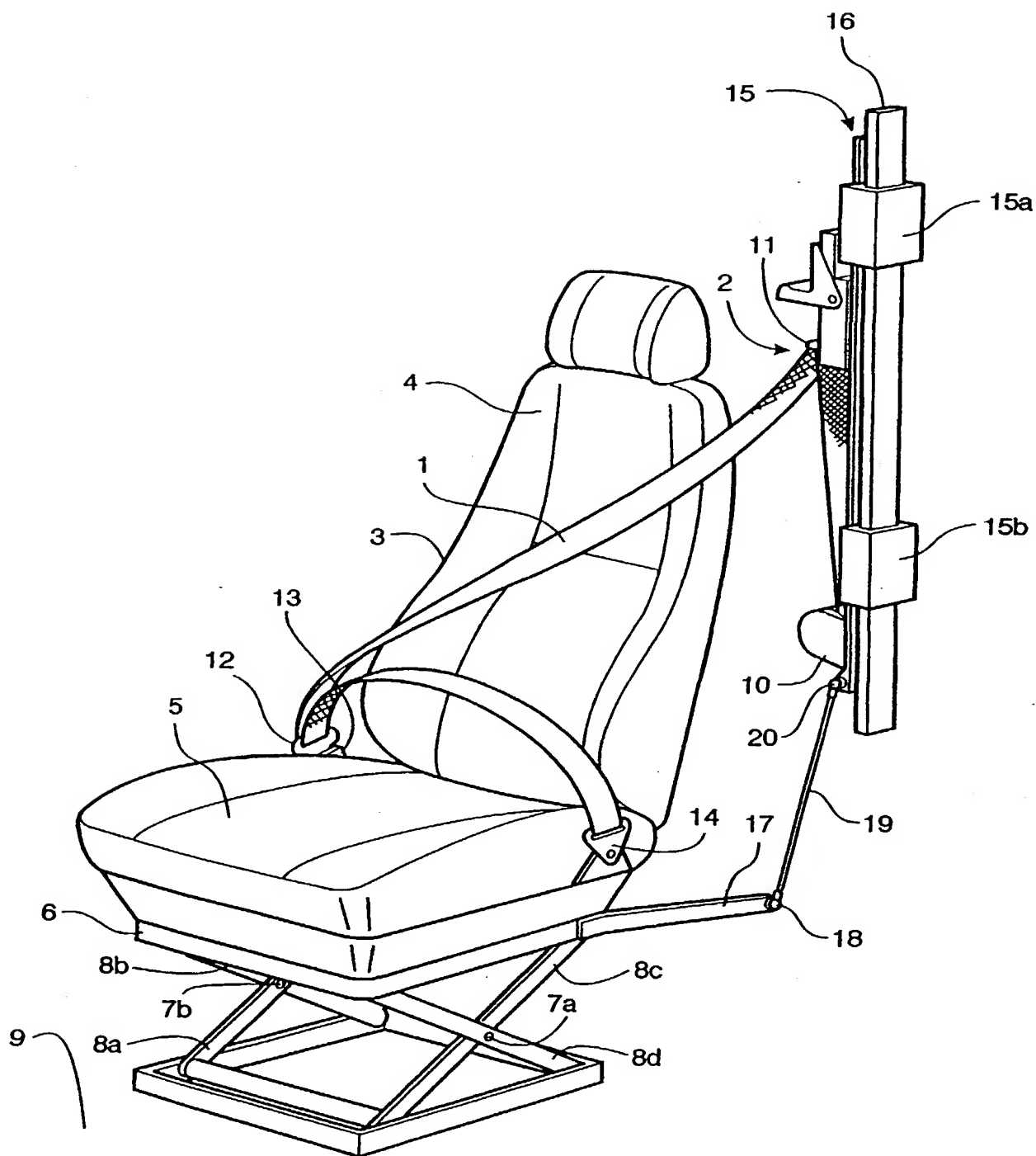


Fig.1

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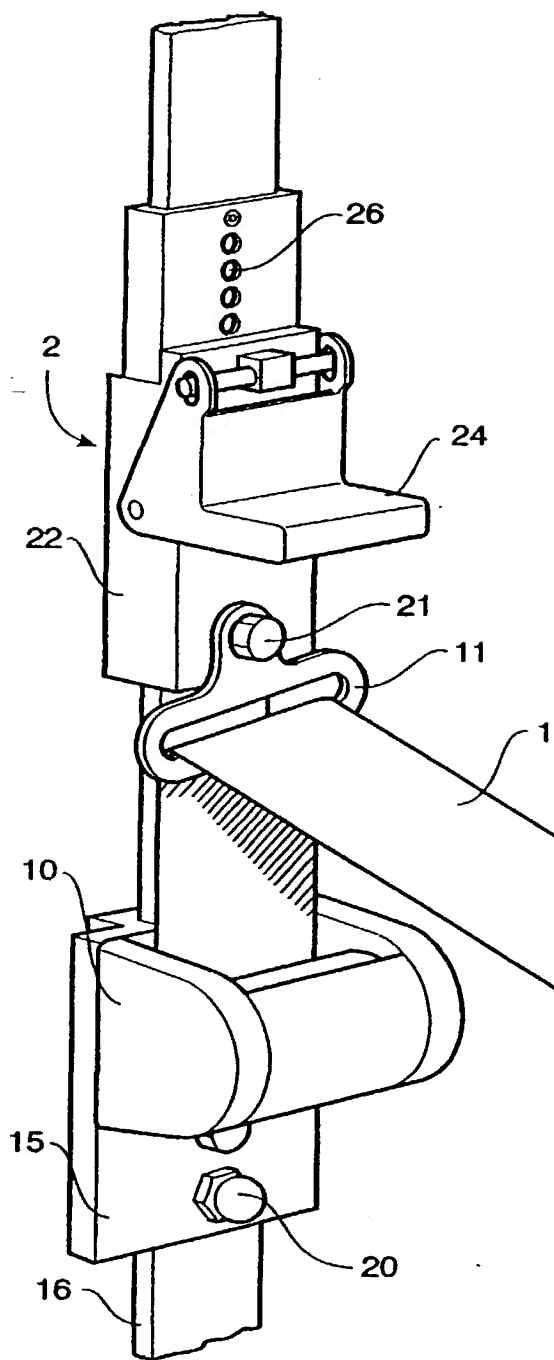


Fig.2

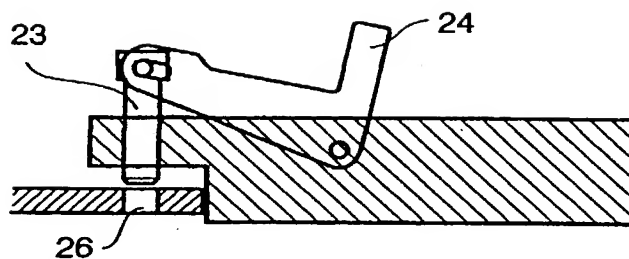


Fig.3

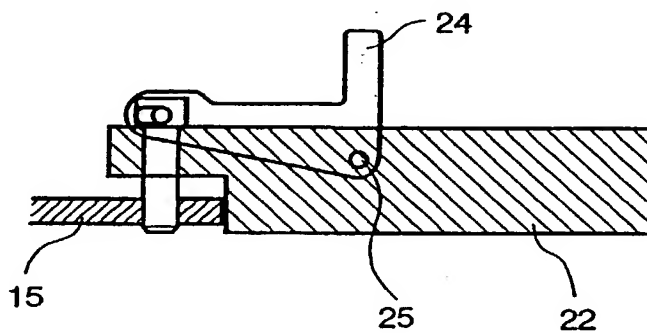


Fig.4



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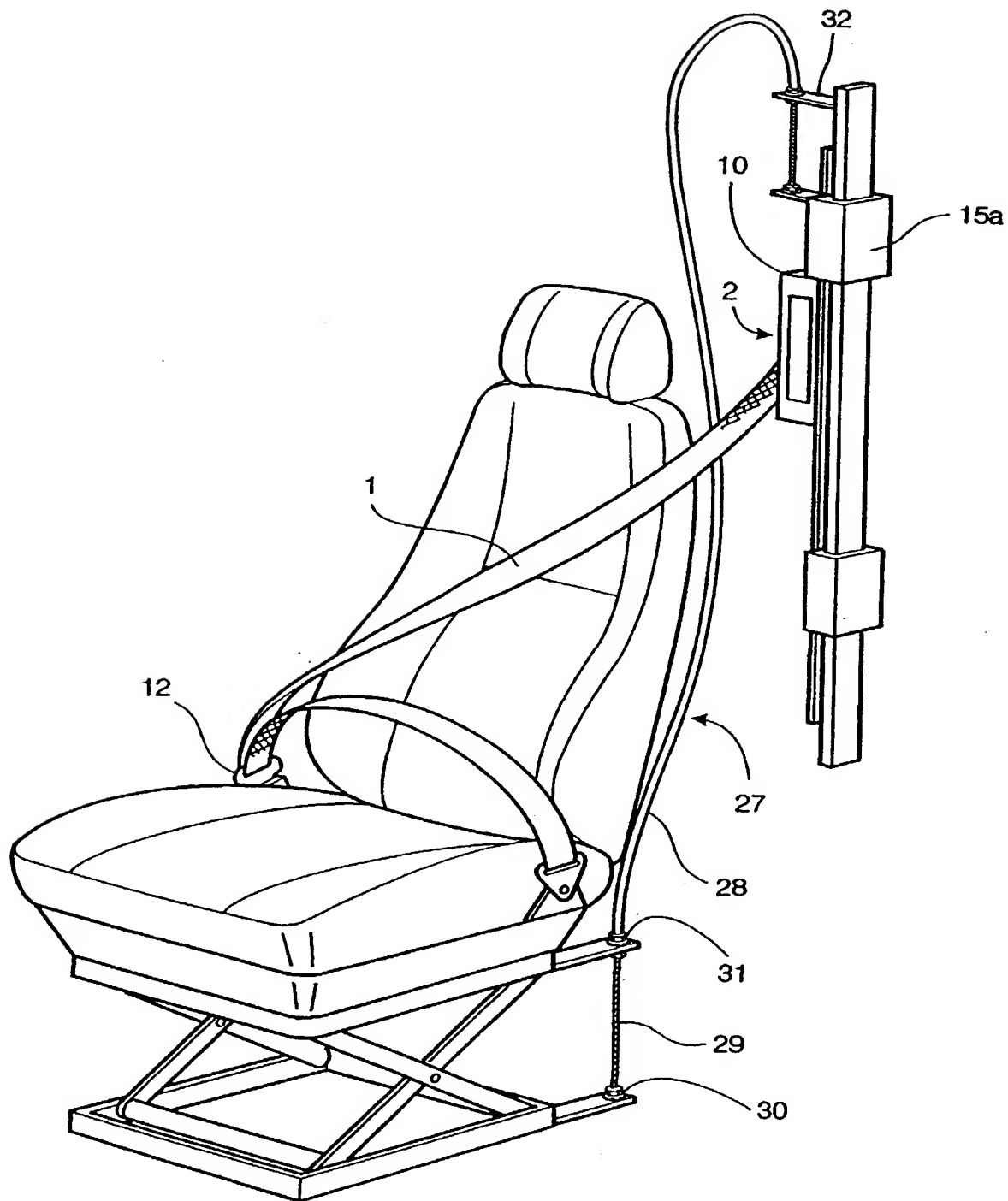


Fig.5

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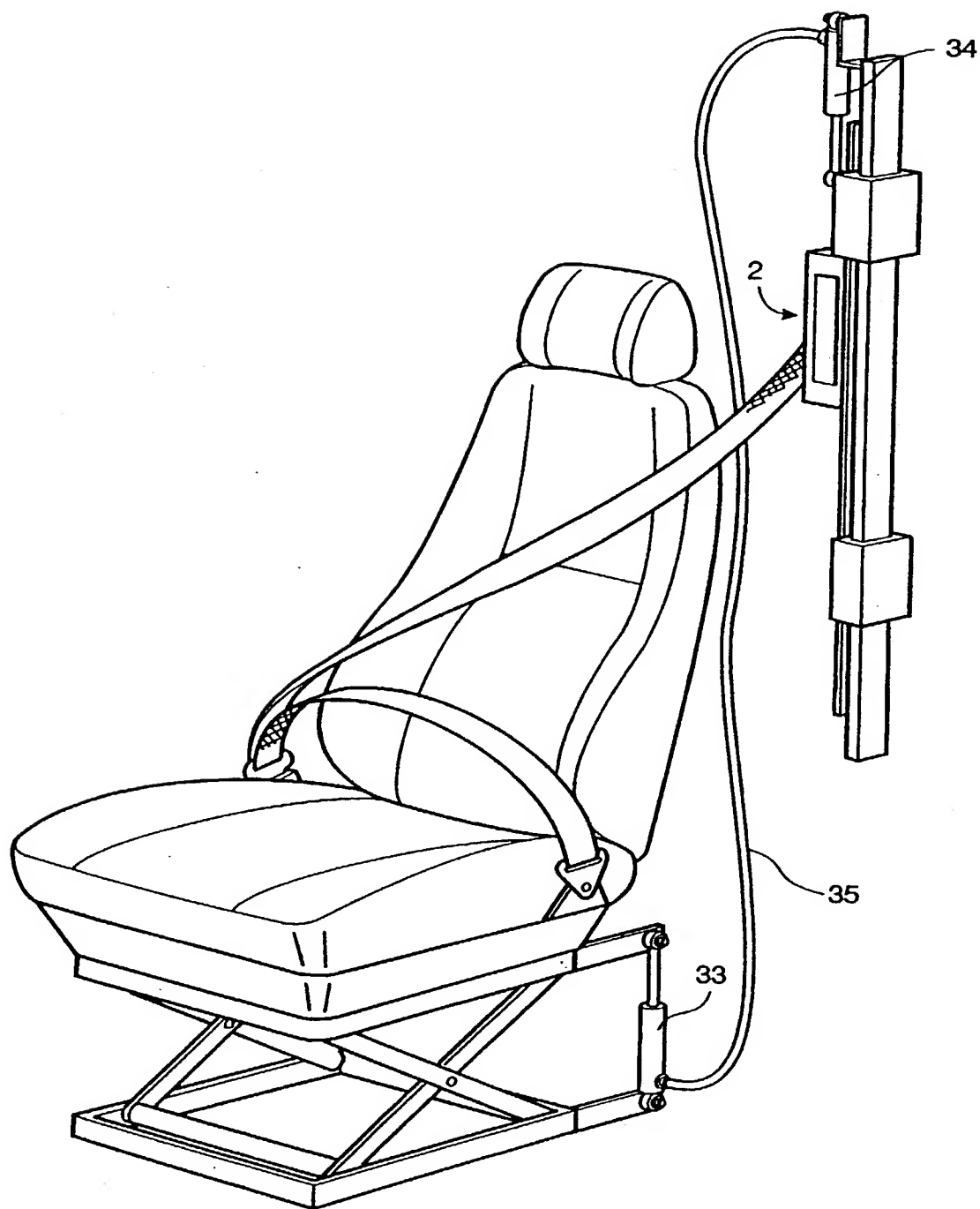


Fig.6

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ARRANGEMENT AND METHOD FOR HEIGHT ADJUSTMENT OF THE UPPER ATTACHMENT  
POINT OF A SAFETY BELT

Fill in Appropriate  
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the specification of which is attached hereto. If not attached hereto,

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## Prior Foreign Application(s)

| (Number)         | (Country)     | (Month/Day/Year Filed) | Priority Claimed  |
|------------------|---------------|------------------------|---|
| <u>9903690-7</u> | <u>Sweden</u> | <u>10.12.1999</u>      | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| ____             | ____          | ____                   | <input type="checkbox"/> Yes <input type="checkbox"/> No            |
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